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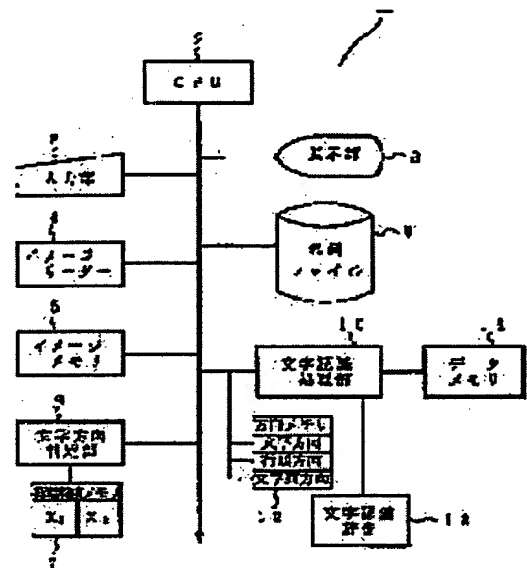
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## (54) CHARACTER RECOGNITION CONTROLLER

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To improve the processing speed of character recognition by the character recognition controller.

**SOLUTION:** To begin with an image reader 5 reads a source document image, and a character direction decision part 6 decides from the read source document image the character string direction and the head direction in the direction crossing the character string direction at right angles, and decides a character direction (character facing direction) according to the decided character string direction and head direction. Then a character recognition processing part 10 performs character recognition as to the whole or part of the source document image according to the character direction decided by the character direction decision part 6.



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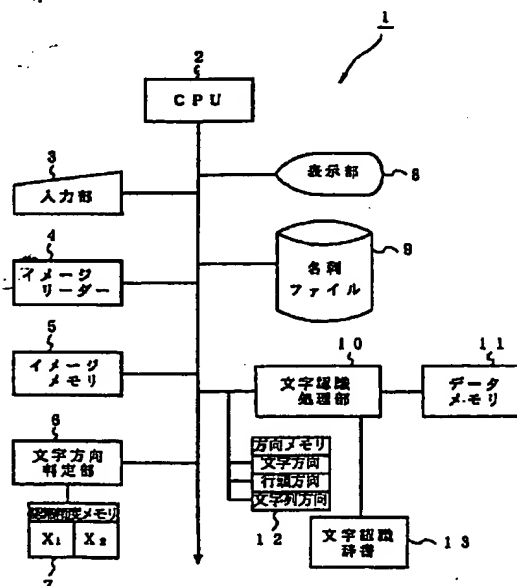
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(54) 【発明の名称】 文字認識制御装置

(57) 【要約】

【課題】 文字認識制御装置の文字認識の処理速度を向上することを課題とする。

【解決手段】 先ず、イメージリーダー5は原稿イメージを読み取り、文字方向判定手続6は、読み取った原稿イメージから文字列方向及び当該文字列方向と直交する方向での行頭方向を判定し、判定された文字列方向及び行頭方向に基づいて、文字方向（文字向き方向）を判定する。そして、文字認識処理部10は、文字方向判定部6で判定された文字方向に基づいて、原稿イメージの全部又は1部に対して文字認識を行う。



## 【特許請求の範囲】

【請求項1】原稿イメージを読み取るイメージ読取り手段と、

前記イメージ読取り手段で読取ったイメージから、文字列方向を判定する文字列方向判定手段と、

前記イメージ読取り手段で読取ったイメージから、前記文字列方向と直交する方向での行頭方向を判定する行頭方向判定手段と、

前記文字列方向判定手段及び前記行頭方向判定手段の判定結果に基づいて、前記イメージ読取り手段で読取ったイメージから、文字方向を判定する文字方向判定手段と、

前記文字方向判定手段で判定された文字方向に基づいて、前記イメージ読取り手段で読取ったイメージに対する文字認識を行う文字認識手段と、

を具備したことを特徴とする文字認識制御装置。

【請求項2】前記文字方向判定手段は、

前記文字列方向判定手段により文字列方向が横であると判定され、かつ前記行頭方向判定手段により行頭方向が左であると判定された場合には、

上下左右の各文字向き候補のうち、“左”、若しくは“上”を文字方向と判定し、

前記文字列方向判定手段により文字列方向が横であると判定され、かつ前記行頭方向判定手段により行頭方向が右であると判定された場合には、

上下左右の各文字向き候補のうち、“右”、若しくは“下”を文字方向と判定し、

前記文字列方向判定手段により文字列方向が縦であると判定され、かつ前記行頭方向判定手段により行頭方向が上であると判定された場合には、

上下左右の各文字向き候補のうち、“右”、若しくは“上”を文字方向と判定し、

前記文字列方向判定手段により文字列方向が縦であると判定され、かつ前記行頭方向判定手段により行頭方向が下であると判定された場合には、

上下左右の各文字向き候補のうち、“左”、若しくは“下”を文字方向と判定することを特徴とする請求項1記載の文字認識制御装置。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、文字認識手段を備えた文字認識制御装置に関する。

【0002】

【従来の技術】従来より、印刷された原稿をイメージスキャナー等を用いてイメージデータとして読み取り、そのイメージデータから文字を英数字、漢字等の文字認識を行って、文字コード化する文字認識制御装置が、パーソナルコンピュータやワードプロセッサ等の文書作成装置において利用されている。かかる文字認識制御装置の文字認識処理は、読み取った原稿イメージ上の1文字

単位で行われており、その認識した文字データの出力内容は、文字コード及びイメージ上の文字の座標位置情報により構成されている。

【0003】また、文字認識処理を行うに際し、文字単位で、上下左右の4方向から、それぞれ文字認識を行い、認識結果の確信度の高い方向を文字方向と確信して、その方向での認識結果を文字コードとして出力していた。

【0004】

【発明が解決しようとする課題】しかし乍ら、かかる従来の文字認識制御装置にあっては、文字単位で、上下左右の4方向から、それぞれ文字認識を行い、認識結果の確信度の高い方向を文字方向（文字向き方向）と確信して、その方向での認識結果を文字コードとしており、文字毎に4方向について文字認識をする必要があるため、処理スピードが遅くなり、作業効率が悪くなるという問題がある。そこで、本発明は、上記問題を解決すべくなされたものであり、文字認識制御装置の文字認識の処理速度を向上することをその課題とする。

【0005】

【課題を解決するための手段】請求項1記載の文字認識制御装置は、原稿イメージを読み取るイメージ読取り手段と、前記イメージ読取り手段で読取ったイメージから、文字列方向を判定する文字列方向判定手段と、前記イメージ読取り手段で読取ったイメージから、前記文字列方向と直交する方向での行頭方向を判定する行頭方向判定手段と、前記文字列方向判定手段及び前記行頭方向判定手段の判定結果に基づいて、前記イメージ読取り手段で読取ったイメージから、文字方向を判定する文字方向判定手段と、前記文字方向判定手段で判定された文字方向に基づいて、前記イメージ読取り手段で読取ったイメージに対する文字認識を行う文字認識手段と、を具備することにより、上記課題を解決する。

【0006】即ち、請求項1記載の文字認識制御装置によれば、まず、イメージ読取り手段により文字情報等のイメージを読み取り、次いで、読み取ったイメージの文字列方向及び行頭方向を夫々、文字列方向判定手段、及び行頭方向判定手段により判定し、文字方向判定手段は、かかる文字列方向判定手段及び行頭方向判定手段の判定結果に基づいて、複数の文字向き方向の候補から可能性の高い文字方向を判定し、次いで、文字認識手段は、文字方向判定手段により判定された文字方向に基づいて、前記イメージ読取り手段で読取った原稿イメージ全体若しくは一部に対する文字認識を行い、文字認識速度を向上させる。従って、文字認識のスピードが向上することができる故、作業者の操作効率が向上する。

【0007】また、この場合、請求項2記載の文字認識制御装置の如く、前記文字向き方向判定手段は、前記文字列方向判定手段により文字列方向が横であると判定され、かつ前記行頭方向判定手段により行頭方向が左であ

ると判定された場合には、上下左右の各文字向き候補のうち、“左”、若しくは“上”を文字方向と判定し、前記文字列方向判定手段により文字列方向が横であると判定され、かつ前記行頭方向判定手段により行頭方向が右であると判定された場合には、上下左右の各文字向き候補のうち、“右”、若しくは“下”を文字方向と判定し、前記文字列方向判定手段により文字列方向が縦であると判定され、かつ前記行頭方向判定手段により行頭方向が上であると判定された場合には、上下左右の各文字向き候補のうち、“右”、若しくは“上”を文字方向と判定し、前記文字列方向判定手段により文字列方向が縦であると判定され、かつ前記行頭方向判定手段により行頭方向が下であると判定された場合には、上下左右の各文字向き候補のうち、“左”、若しくは“下”を文字方向と判定することにしても良い。

【0008】即ち、請求項2記載の文字認識制御装置によれば、当該文字向き方向判定手段は、文字列方向が横であると判定され、かつ行頭方向が左であると判定された場合には、上下左右の各文字向き候補のうち、“左”、若しくは“上”を文字方向と判定し、また、文字列方向が横であると判定され、かつ行頭方向が右であると判定された場合には、“右”、若しくは“下”を文字方向と判定し、また、文字列方向が縦であると判定され、かつ行頭方向が上であると判定された場合には、上下左右の各文字向き候補のうち、“右”、若しくは“上”を文字方向と判定し、また、文字列方向が縦であると判定され、かつ行頭方向が下であると判定された場合には、“左”、若しくは“下”を文字方向と判定する。従って、請求項1記載の効果に加えて、簡便な方向かつ高速度で、文字方向を判定することができる。

【0009】

【発明の実施の形態】以下、本発明の実施の形態を図1乃至6を参照しつつ説明する。先ず、構成を説明する。図1は、本発明が適用される文字認識制御装置の一実施例のブロック図である。図1において、文字認識制御装置1は、CPU（中央演算処理装置）2と、入力部3と、イメージリーダー4と、イメージメモリ5と、文字方向判定部6と、認識精度メモリ7、表示部8と、文字認識処理部10と、データメモリ11と、方向メモリ12と、及び文字認識辞書13と、から構成されており、各部はバスライン14を介して互いに接続されている。

【0010】CPU2は、図示しないROMに格納されている各種制御プログラムに従って文字認識制御装置の各部を制御し、各種文字認識処理を実行し、その処理過程及び処理結果を表示部8に表示させる。また、CPU2は、入力部3の指示に応じて、図示しないROMに格納された文書読み込み処理プログラムに従って、後述する文書読み込み処理を実行する。

【0011】具体的には、先ず、CPU2は、イメージリーダー4に、名刺等の原稿のイメージを読み取らせ、読

み取ったイメージデータをイメージメモリ5に格納する。次いで、文字方向判定部6に文字方向判定処理を実行させ、読み取ったイメージデータから原稿の文字列方向（行方向若しくは列方向）を判定させると共に、判定した文字列方向と直交する方向での行頭方向を判定させ、これら判定された文字列方向及び行頭方向に基づいて、文字方向（文字向き方向）を判定させる。さらに、文字認識部10に文字認識処理を実行させ、文字方向判定部6で判定した文字方向に基づいて、読みとったイメージデータについて文字認識処理を実行させ、その認識したイメージデータ（文字データ）の文字コード及びイメージ上の文字の座標位置情報等（各文字コードの文字ポイントサイズ、行ピッチ、文字間の平均桁ピッチ、上余白及び左余白の各データ）をデータメモリ11に格納させる。

【0012】また、CPU2は、データメモリ11に格納された文字コード及びイメージ上の文字の座標位置情報等を名刺単位で名刺ファイル9に格納する。入力部3は、カーソルキー、数字入力キー、文字入力キー及びファンクションキー等を備え、押下されたキーの押下信号をCPU2に出力する。

【0013】イメージリーダー4は、例えば、ラインイメージセンサを読取対象画面上を所定速度で走査し、1ライン毎にラインイメージセンサで読み取ってイメージデータをイメージメモリ5に供給する。イメージメモリ5は、イメージリーダー4から入力される読取原稿のイメージデータを格納するメモリ領域を形成する。

【0014】文字方向判定部6は、CPU2の制御により文字方向判定処理を実行し、先ず、イメージリーダー4により読み込まれイメージメモリ5に格納されたイメージデータの文字列方向及び行頭方向を判定し、判定された文字列方向及び行頭方向に基づいて、各文字方向について文字認識辞書13を参照することにより文字認識を実行して、各文字方向について夫々認識精度を算出し、認識精度の高い文字方向を文字方向として確定する。

【0015】また、文字方向判定部6は、判定した文字列方向、行頭方向、及び、文字方向は方向メモリ12に格納すると共に、算出した文字認識精度は、認識精度メモリ7に格納する。認識精度メモリ7は、文字方向判定部6により算出された認識精度の結果を格納するためのメモリエリアを形成する。

【0016】表示部8は、CPU2によって実行される各種処理の処理過程及び処理結果等を表示する。文字認識処理部10は、CPU2の制御により文字認識処理を実行し、文字判定処理部6により判定された文字方向に基づいて、イメージメモリ5に格納されたイメージデータから抽出された文字を認識し、その認識した文字に対応する文字コードを文字認識辞書から読み出し、文字の座標位置情報等（文字ポイントサイズ、行ピッチ、文字間の平均桁ピッチ、上余白及び左余白の各データ）と共

にデータメモリ11に格納する。

【0017】データメモリ11は、文字認識処理部10により実行される文字認識処理によって認識された文字の文字コード及び座標位置情報等（文字ポイントサイズ、行ピッチ、文字間の平均桁ピッチ、上余白及び左余白の各データ）を格納するためメモリエリアを形成する。方向メモリ12は、文字方向判定部6によって判定されたイメージデータの文字列方向、行頭方向、及び文字方向等のデータを格納するためのメモリエリアを形成する。

【0018】文字認識辞書13は、文字コードデータを格納し、文字方向判定部6により実行される文字方向判定処理において、文字の認識精度を算出する際及び文字認識処理部10の文字認識処理の際に利用される。名刺ファイル9は、文字認識処理部10の文字認識処理の結果、データメモリ11に格納された文字コード及び座標位置情報等（文字ポイントサイズ、行ピッチ、文字間の平均桁ピッチ、上余白及び左余白の各データ）を名刺単位で格納するためのメモリエリアを形成する。

【0019】次に、動作を説明する。まず、CPU2により実行される文書読み込み処理について図2に示すフローチャートに基づいて、図4及び図5を参照して説明する。図2は、CPU2により実行される文書読み込み処理を説明するためのフローチャートである。本実施例においては、特に、名刺のイメージデータの読み取り処理について説明する。図2において、まず、CPU2は、イメージリーダー4に、名刺のイメージデータを読み込ませ、読み取ったイメージデータをイメージメモリ5に格納し（ステップS1）、次いで、文字方向判定部6に、文字方向判定処理を実行させ、この読み取ったイ  
30 メージデータの文字列方向、行頭方向、及び文字方向を判定させる（ステップS2）。

【0020】この文字方向判定処理について図3及び図4に示すフローチャートに基づいて図5及び図6を参照して詳細に説明する。図3及び図4は、CPU2の制御によって、文字方向判定部6により実行される文字方向判定処理を説明するためのフローチャートである。

【0021】図5は、文字方向判定処理の文字列方向及び行頭方向を判定する行程を説明するための図である。図6は、文字方向判定処理の文字方向を判定する行程を説明するための図である。ところで、日本語においては、縦書きと横書きとがあるので、これら縦書きと横書きとの区別即ち文字列方向を認識する必要があり、さらに、原稿の方向により、例えば図6（A）～（H）に示す如く8種類の文字方向（文字向き方向）が考えられる。

【0022】図3において、まず、例えば、図5（A）に示すような名刺のイメージデータがイメージリーダー4により読み取られて、イメージメモリ5に格納されたイメージデータを、図5（B）の如く行ブロックに分割  
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し、かかる行ブロックの方向即ち文字列方向をイメージメモリ5に格納されたイメージデータの文章レイアウトから判定する（ステップS11）。図5（B）に示されるように文字列方向（行ブロック方向）が横方向である場合には、文字列方向を横方向と判定して、ステップS12に移行する一方、文字列方向が縦方向であると判定した場合には、図14のステップS31に移行する。

【0023】次いで、ステップS12において、判定された文字列方向（横方向）と直交する方向での行ブロックの行揃い方向即ち行頭方向が左か右かをイメージデータの文章レイアウトから解析し、行の揃う方向を行頭方向と判定する（ステップS12）。この場合、図5  
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（B）に示されるように行頭方向が左方向である場合には、行頭方向が左方向であると判断してステップS13に移行する一方、行頭方向が右方向であると判断した場合にはステップS14に移行する。

【0024】尚、行頭方向が、右方向と左方向に混在する場合は、行頭方向の総計が多い側の方向を行頭方向と確定する。ステップS12において、行頭方向が左方向であると判断した場合には、例えば、図6（A）、  
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（B）に示すように、文字方向が“左”の場合と“右”の場合が考えられる。

【0025】そこで、まず、ステップ13においては、文字方向を“上”として文字認識を行い（ステップS13）、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較（パターンマッチング）を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX1として、認識精度メモリ7に格納する（ステップS14）。  
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【0026】次いで、文字方向を“左”として文字認識を行い（ステップS15）、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較（パターンマッチング）を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX2として、認識精度メモリ7に格納する（ステップS14）。

【0027】そして、ステップS17では、認識精度メモリ7に格納された認識精度X1とX2とを比較して、認識精度の高い方向を文字方向として確定し（ステップS17）、当該文字方向判定処理を終了して、図2のステップS3の文字認識処理に移行する。一方、ステップS12において、行頭方向が右方向であると判断した場合には、例えば、図6（C）、（D）に示すように、文字方向が“右”の場合と“下”の場合が考えられる。

【0028】そこで、まず、ステップ18においては、文字方向を“下”として文字認識を行い（ステップS18）、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較（パターンマッチング）  
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を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX1として、認識精度メモリ7に格納する(ステップS19)。

【0029】次いで、文字方向を"右"として文字認識を行い(ステップS20)、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較(パターンマッチング)を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX2として、認識精度メモリ7に格納し(ステップS21)、ステップS17に移行する。

【0030】また、ステップS11において、文字列方向(行ブロック)が縦方向であると判断した場合には、図4に示すステップS31に移行し、判定された文字列方向(縦方向)と直交する方向での行頭方向が"上方向"か"下方向"かをイメージデータの文章レイアウトから解析し、行の揃う方向を行頭方向と判定し(ステップS31)、行頭方向が上方向であると判定した場合にはステップS32に移行する一方、行頭方向が下方向であると判断した場合にはステップS36に移行する。

【0031】ステップS31において、行頭方向が上方向であると判断した場合には、例えば、図6(E)、(F)に示すように、文字方向が"上"の場合と"右"の場合が考えれる。

【0032】そこで、まず、ステップ32においては、文字方向を"上"として文字認識を行い(ステップS32)、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較(パターンマッチング)を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX1として、認識精度メモリ7に格納する(ステップS33)。

【0033】次いで、文字方向を"右"として文字認識を行い(ステップS34)、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較(パターンマッチング)を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX2として、認識精度メモリ7に格納し(ステップS34)、図3のステップS17に移行する。

【0034】ステップS31において、行頭方向が下方向であると判断した場合には、例えば、図6(G)、(H)に示すように、文字方向が"下"の場合と"左"の場合が考えれる。

【0035】そこで、まず、ステップ36においては、文字方向を"下"として文字認識を行い(ステップS36)、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較(パターンマッチング)を行い、認識した文字と、かかる基準文字の中で認識し

た文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX1として、認識精度メモリ7に格納する(ステップS37)。

【0036】次いで、文字方向を"左"として文字認識を行い(ステップS38)、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較(パターンマッチング)を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字との類似度即ち認識精度を算出し、得られた認識精度をX2として、認識精度メモリ7に格納し(ステップS39)、図3のステップS17に移行する。

【0037】そして、図2のステップ3においては、CPU2は、文字認識処理部10に文字認識処理を実行させ、文字認識処理部10は、図3のステップS17で文字方向判定部6により確定された文字方向で、原稿から読み取った原稿イメージ全体に対する文字認識を行う。具体的には、図3のステップS17で確定した文字方向に基づいて、イメージメモリ5に格納された原稿イメージデータから抽出された文字を認識し、その認識した文字と、予め文字認識辞書13に格納されている基準文字との比較(パターンマッチング)を行い、認識した文字と、かかる基準文字の中で認識した文字に最も近似している文字の文字コード及びイメージ上の文字の座標位置情報等をデータメモリ11に格納し(ステップS3)、ステップS4においては、CPU2は、データメモリ11に格納された文字コード及びイメージ上の文字の座標位置情報等を名刺単位で名刺ファイルに格納し(ステップS4)、当該文書読み込み処理を終了する。

【0038】上記した実施例においては、限定した文字方向で、原稿イメージ全体の文字認識を行う構成である故、従来の文字認識制御装置の如き文字単位で、上下左右の4方向から、それぞれ文字認識を行う方法に比して、認識回数が少なくなり、文字認識の処理スピードを上がり、操作者の作業効率が向上する。また、上記実施例においては、かかる文字方向を、文字列方向、文字方向、及び文字認識精度に基づいて判定しているので、簡便な方法でかつ精度良く、文字方向を判定することができる。

【0039】尚、上記実施例においては、名刺を読み取る場合を説明したが、本発明はこれに限定されるものではなく、例えば葉書や通常の文書データ等を読み取ることにしても良い。また、上記実施例においては、日本語を読み取る場合を説明したが、本発明はこれに限定されるものではなく、例えば、英語等を読み取ることにしても良い。

【0040】また、上記実施例においては、限定した文字方向で、原稿イメージ全体の文字認識を行うにしているが、原稿イメージの一部を限定した文字方向で文字認識することにしても良い。また、上記実施例においては、文字認識処理をパターンマッチングで行っているが

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構造解析法で文字認識処理をおこなっても良い。

【0041】

【発明の効果】以上説明したように、請求項1記載の文字認識制御装置によれば、限定した文字方向で、原稿イメージ全体又は一部の文字認識を行う構成である故、認識回数が少なくなつて、文字認識の処理スピードを上げ、操作者の作業効率が向上させることが可能となる。

【0042】また、請求項2記載の文字認識制御装置によれば、文字方向を、文字列方向、文字方向、及び文字認識精度に基づいて判定しているのので、簡便な方法でかつ精度良く、文字方向を判定することができる。

【図面の簡単な説明】

【図1】本発明を適用した文字認識制御装置のブロック構成図

【図2】図1のCPUにより実行される文書読み込み処理を説明するためのフローチャート。

【図3】図1の文字方向判定部により実行される文字判定処理を説明するための第1のフローチャート。

【図4】図1の文字方向判定部により実行される文字判定処理を説明するための第2のフローチャート。

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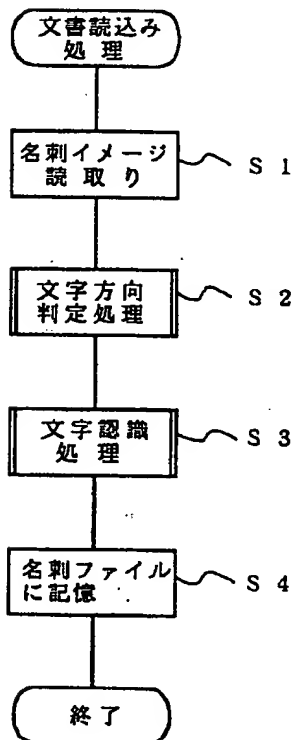
【図5】図1の文字方向判定部により実行される文字方向判定処理における文字列方向及び行頭方向を判定する行程を説明するための図。

【図6】図1の文字方向判定部により実行される文字方向判定処理における文字方向を判定する行程を説明するための図。

【符号の説明】

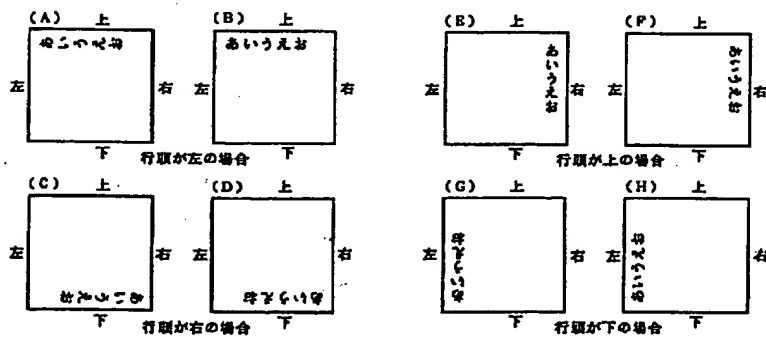
- 1 文字認識制御装置
- 2 CPU
- 3 入力部
- 4 イメージリーダー
- 5 イメージメモリ
- 6 文字方向判定部
- 7 認識精度メモリ
- 8 表示部
- 9 名刺ファイル
- 10 文字認識処理部
- 11 データメモリ
- 12 方向メモリ
- 13 文字認識辞書

【図2】



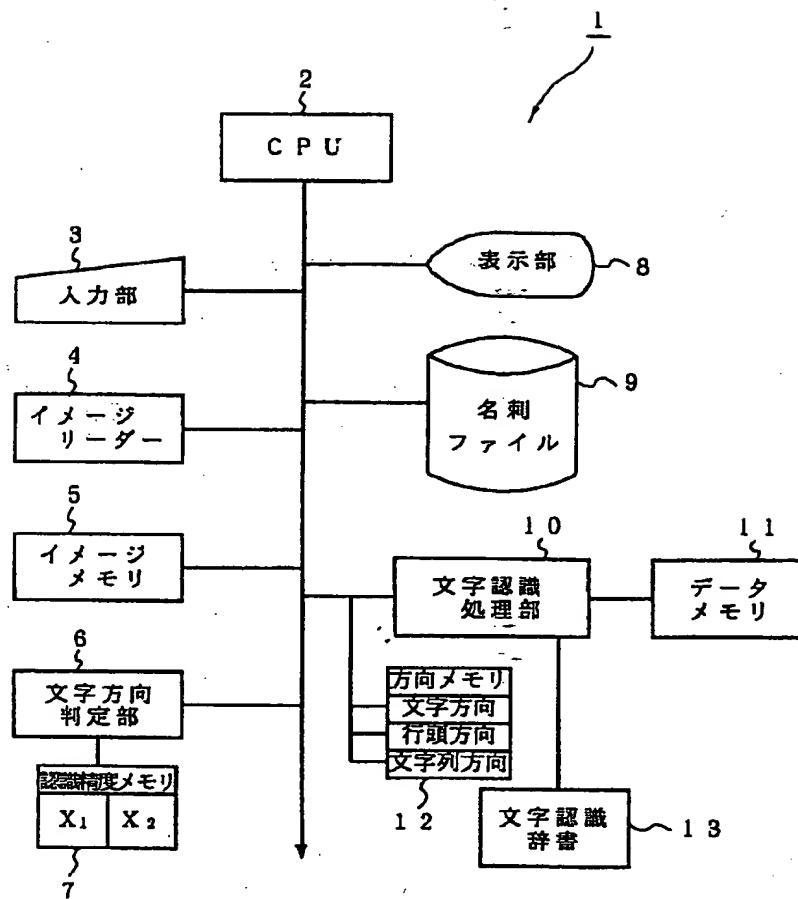
【図6】

行頭位置から、可能な文字方向を限定する

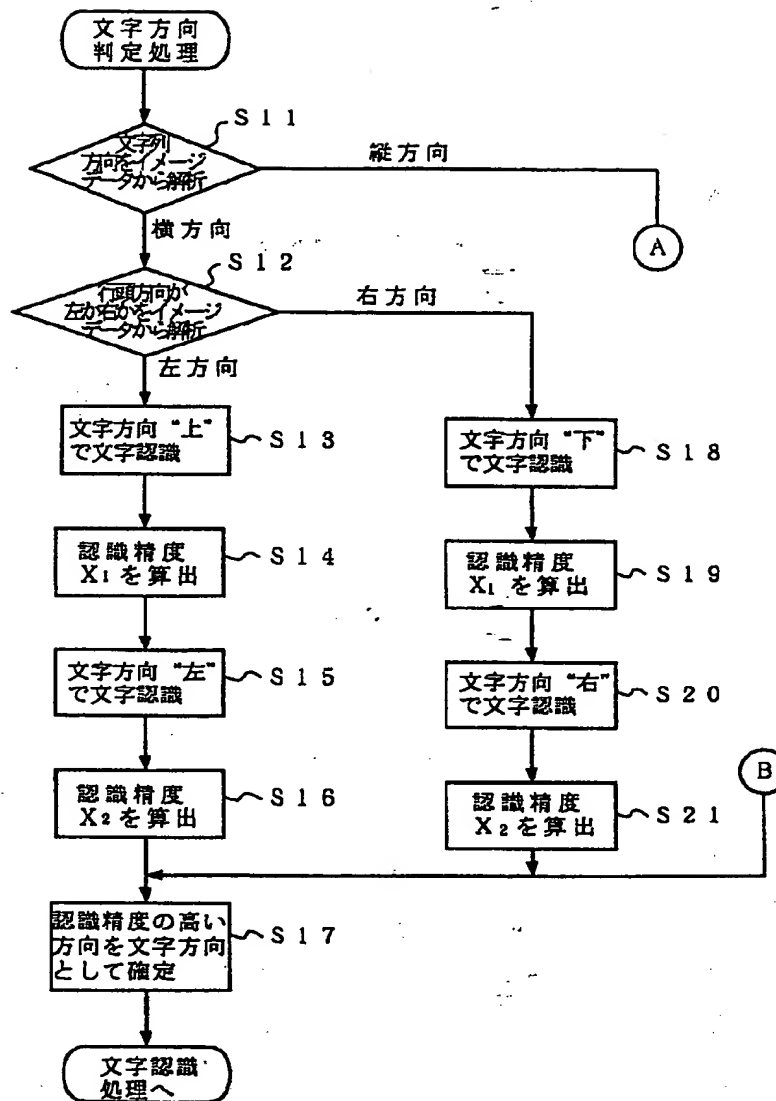




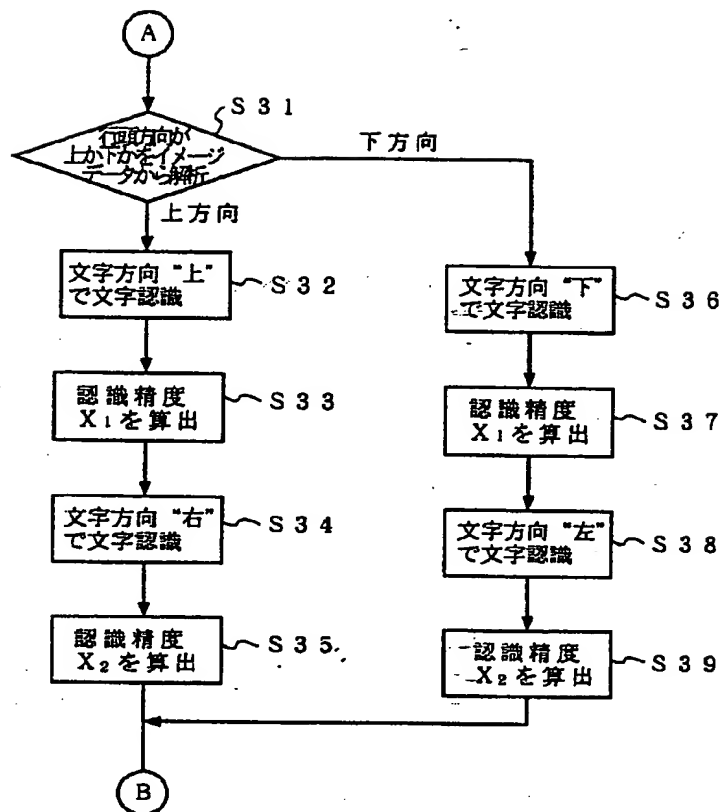
【図1】



【図3】

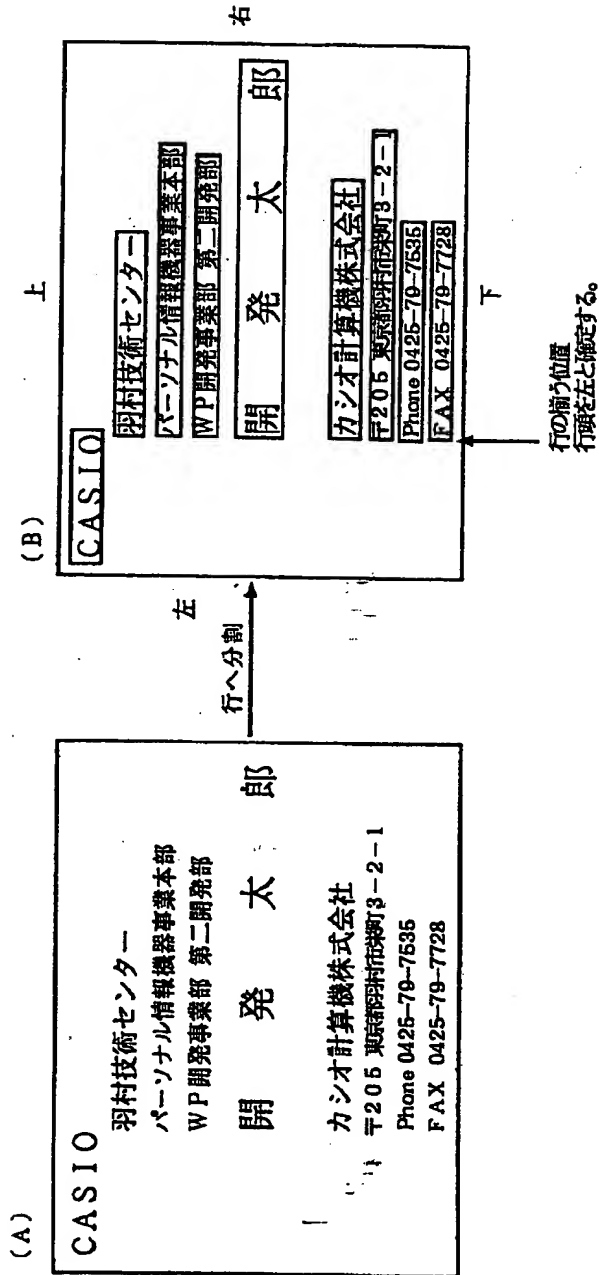


【図4】



【図5】

文書レイアウトから、行頭位置を確定する



# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : CASIO COMPUT CO LTD

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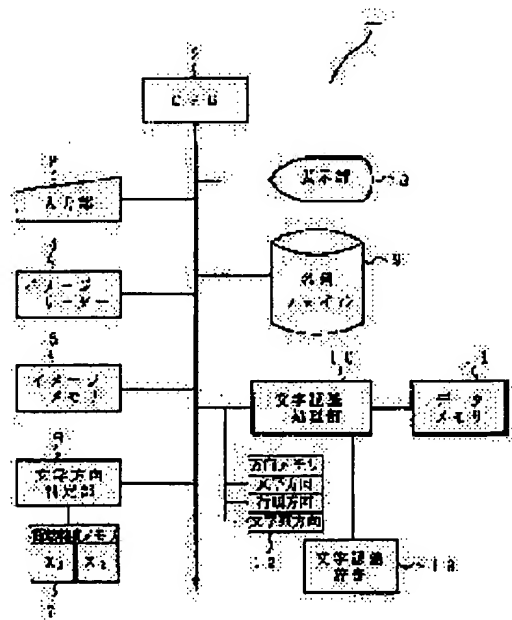
(72)Inventor : O TAKESHI

## (54) CHARACTER RECOGNITION CONTROLLER

### (57)Abstract:

PROBLEM TO BE SOLVED: To improve the processing speed of character recognition by the character recognition controller.

SOLUTION: To begin with an image reader 5 reads a source document image, and a character direction decision part 6 decides from the read source document image the character string direction and the head direction in the direction crossing the character string direction at right angles, and decides a character direction (character facing direction) according to the decided character string direction and head direction. Then a character recognition processing part 10 performs character recognition as to the whole or part of the source document image according to the character direction decided by the character direction decision part 6.



## LEGAL STATUS

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application converted registration]

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[Patent number]

[Date of registration]

[Number of appeal against examiner's  
decision of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

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3. In the drawings, any words are not translated.

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 CLAIMS
 

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## [Claim(s)]

[Claim 1] An image read means to read a manuscript image, and a direction judging means of a character string to judge the direction of a character string from the image read with said image read means, A direction judging means of the head of the sentence to judge the direction of the head of the sentence in said direction of a character string, and the direction which intersects perpendicularly from the image read with said image read means, A direction judging means of an alphabetic character to judge the direction of an alphabetic character from the image read with said image read means based on the judgment result of said direction judging means of a character string, and said direction judging means of the head of the sentence, The character recognition control unit characterized by providing a character recognition means to perform character recognition to the image read with said image read means, based on the direction of an alphabetic character judged with said direction judging means of an alphabetic character.

[Claim 2] When it is judged with the direction of a character string being width by said direction judging means of a character string and judges that the direction of the head of the sentence is the left with said direction judging means of the head of the sentence, said direction judging means of an alphabetic character The "left" or a "top" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character. When it is judged with the direction of a character string being width by said direction judging means of a character string and is judged with the direction of the head of the sentence being the right by said direction judging means of the head of the sentence The "right" or the "bottom" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character. When it is judged with the direction of a character string being length by said direction judging means of a character string and is judged with the direction of the head of the sentence being a top by said direction judging means of the head of the sentence The "right" or a "top" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character. When it is judged with the direction of a character string being length by said direction judging means of a character string and is judged with the direction of the head of the sentence being the bottom by said direction judging means of the head of the sentence The character recognition control unit according to claim 1 characterized by judging the "left" or the "bottom" to be the direction of an alphabetic character among each vertical and horizontal alphabetic character sense candidate.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the character recognition control unit equipped with the character recognition means.

[0002]

[Description of the Prior Art] Conventionally, the printed manuscript is read as an image data using an image scanner etc., and the character recognition control unit which performs character recognition, such as an alphabetic character and a kanji, and character-code-izes an alphabetic character is used in document preparation equipments, such as a personal computer and a word processor, from the image data. Character recognition processing of this character recognition control device is performed per one character on the read manuscript image, and the contents of an output of the recognized alphabetic data are constituted by a character code and the coordinate positional information of the alphabetic character on an image.

[0003] Moreover, it faced performing character recognition processing, and per alphabetic character, from the four directions of vertical and horizontal, character recognition was performed, respectively, it was sure that the high direction of the reliability of a recognition result is the direction of an alphabetic character, and the recognition result in the direction was outputted as a character code.

[0004]

[Problem(s) to be Solved by the Invention] However, if it is in \*\* et al. and this conventional character recognition control unit, there is a problem that are an alphabetic character unit, and a process speed becomes slow and working efficiency worsens since character recognition is performed, respectively, it is sure that the high direction of the reliability of a recognition result is the direction of an alphabetic character (the alphabetic character sense direction), the recognition result in the direction is used as the character code and it is necessary to carry out character recognition about four directions for every alphabetic character from the four directions of vertical and horizontal. Then, this invention is made that the above-mentioned problem should be solved, and makes it the technical problem to improve the processing speed of the character recognition of a character recognition control unit.

[0005]

[Means for Solving the Problem] An image read means by which a character recognition control device according to claim 1 reads a manuscript image, A direction judging means of a character string to judge the direction of a character



string from the image read with said image read means, A direction judging means of the head of the sentence to judge the direction of the head of the sentence in said direction of a character string, and the direction which intersects perpendicularly from the image read with said image read means, A direction judging means of an alphabetic character to judge the direction of an alphabetic character from the image read with said image read means based on the judgment result of said direction judging means of a character string, and said direction judging means of the head of the sentence, The above-mentioned technical problem is solved by providing a character recognition means to perform character recognition to the image read with said image read means, based on the direction of an alphabetic character judged with said direction judging means of an alphabetic character.

[0006] According to the character recognition control device according to claim 1, images, such as text, are first read with an image read means. Namely, subsequently The direction of a character string and the direction of the head of the sentence of an image which were read are judged with the direction judging means of a character string, and the direction judging means of the head of the sentence, respectively. The direction judging means of an alphabetic character Based on the judgment result of this direction judging means of a character string, and the direction judging means of the head of the sentence, the high direction of an alphabetic character of possibility is judged from the candidate of two or more alphabetic character sense directions. Subsequently a character recognition means Based on the direction of an alphabetic character judged by the direction judging means of an alphabetic character, character recognition to the whole manuscript image read with said image read means or a part is performed, and a character recognition rate is raised. Therefore, the reason and an operator's actuation effectiveness whose speed of character recognition can improve improve.

[0007] In this case, like a character recognition control unit according to claim 2 moreover, said alphabetic character sense direction judging means When it is judged with the direction of a character string being width by said direction judging means of a character string and is judged with the direction of the head of the sentence being the left by said direction judging means of the head of the sentence The "left" or a "top" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character. When it is judged with the direction of a character string being width by said direction judging means of a character string and is judged with the direction of the head of the sentence being the right by said direction judging means of the head of the sentence The "right" or the "bottom" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character. When it is judged with the direction of a character string being length by said direction judging means of a character string and is judged with the direction of the head of the sentence being a top by said direction judging means of the head of the sentence The "right" or a "top" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character. When it is judged with the direction of a character string being length by said direction judging means of a character string and is judged with the direction of the head of the sentence being the bottom by said direction judging means of the head of the sentence, you may decide to judge the "left" or the "bottom" among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character.

[0008] According to the character recognition control unit according to claim 2, namely, the alphabetic character sense direction judging means concerned When it is judged with the direction of a character string being width and is judged with the direction of the head of the sentence being the left When the "left" or a "top" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character, it is judged with the direction of a character string being width and it is judged with the direction of the head of the sentence being the right When the "right" or the "bottom" is judged to be alphabetic character \*\*\*\*\*, it is judged with the direction of a character string being length and it is judged with the direction of the head of the sentence being a top When the "right" or a "top" is judged among each vertical and horizontal alphabetic character sense candidate to be the direction of an alphabetic character, it is judged with the direction of a character string being length and it is judged with the direction of the head of the sentence being the bottom, the "left" or the "bottom" is judged to be the direction of an alphabetic character. Therefore, in addition to effectiveness according to claim 1, the direction of an alphabetic character can be judged at a simple direction and simple high speed.

[0009]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to drawing 1 thru/or 6. First, a configuration is explained. Drawing 1 is the block diagram of one example of the character recognition control device with which this invention is applied. drawing 1 -- setting -- the character recognition control device 1 -- CPU (arithmetic and program control)2, the input section 3, an image reader 4, image memory 5, the direction judging section 6 of an alphabetic character, the recognition precision memory 7 and a display 8, the character recognition processing section 10, data memory 11, the direction memory 12, and the character recognition dictionary 13 -- since -- it is constituted and each part of each other is connected through the bus line 14.

[0010] CPU2 controls each part of a character recognition control unit according to the various control programs stored in ROM which is not illustrated, performs various character recognition processings, and displays the processing process and a processing result on a display 8. Moreover, CPU2 performs document reading processing mentioned later according to the document reading processing program stored in ROM which is not illustrated according to directions of the input section 3.

[0011] Specifically, CPU2 stores in image memory 5 first the image data which the image reader 4 was made to read the image of manuscripts, such as a card, and was read. Subsequently, the direction judging section 6 of an alphabetic character is made to perform the direction judging processing of an alphabetic character, and while making the direction of a character string of a manuscript (a line writing direction or the direction of a train) judge from the read image data, the direction of an alphabetic character (the alphabetic character sense direction) is made to judge based on the direction of a character string and the direction of the head of the sentence which were made to judge the direction of the head of the sentence in the judged direction of a character string, and the direction which intersects perpendicularly, and were these-judged. Furthermore, the character recognition section 10 is made to perform character recognition processing, character recognition processing is performed about the read image data based on

the direction of an alphabetic character judged in the direction judging section 6 of an alphabetic character, and the character code of the recognized image data (alphabetic data), the coordinate positional information of the alphabetic character on an image, etc. are made to store in data memory 11 (each data of the alphabetic character point size of each character code, a row pitch, the average digit pitch between alphabetic characters, an upper margin, and a left margin).

[0012] Moreover, CPU2 stores in the card file 9 the character code stored in data memory 11, the coordinate positional information of the alphabetic character on an image, etc. per card. The input section 3 is equipped with a cursor key, a figure input key, an alphabetic character input key, a function key, etc., and outputs the depression signal of the pressed key to CPU2.

[0013] An image reader 4 scans the screen top for reading at a predetermined rate, reads for example, the Rhine image sensors with the Rhine image sensors for every line, and supplies an image data to image memory 5. Image memory 5 forms the memory area which stores the image data of the reading manuscript inputted from an image reader 4.

[0014] The direction judging section 6 of an alphabetic character performs the direction judging processing of an alphabetic character by control of CPU2. First, the direction of a character string and the direction of the head of the sentence of an image data which were read by the image reader 4 and stored in image memory 5 are judged. Based on the direction of a character string and the direction of the head of the sentence which were judged, by referring to the character recognition dictionary 13 about each alphabetic character direction, character recognition is performed, recognition precision is computed about each alphabetic character direction, respectively, and the direction of an alphabetic character where recognition precision is high is decided as a direction of an alphabetic character.

[0015] Moreover, the direction judging section 6 of an alphabetic character stores the computed character recognition precision in the recognition precision memory 7 while storing the judged direction of a character string, the direction of the head of the sentence, and the direction of an alphabetic character in the direction memory 12. The recognition precision memory 7 forms the memory area for storing the result of the recognition precision computed by the direction judging section 6 of an alphabetic character.

[0016] A display 8 displays a processing process, a processing result, etc. of various processings which are performed by CPU2. The character recognition processing section 10 performs character recognition processing by control of CPU2. Based on the direction of an alphabetic character judged by the alphabetic character judging processing section 6, the alphabetic character extracted from the image data stored in image memory 5 is recognized. The character code corresponding to the recognized alphabetic character is read from a character recognition dictionary, and it stores in data memory 11 with the coordinate positional information of an alphabetic character etc. (each data of alphabetic character point size, a row pitch, the average digit pitch between alphabetic characters, an upper margin, and a left margin).

[0017] Also since data memory 11 stores a character code, coordinate positional information, etc. of an alphabetic character which have been recognized by character recognition processing performed by the character recognition processing section 10 (each data of alphabetic character point size, a row pitch, the average

digit pitch between alphabetic characters, an upper margin, and a left margin), it forms a memory area. The direction memory 12 forms the memory area for storing data, such as the direction of a character string of the image data judged by the direction judging section 6 of an alphabetic character, the direction of the head of the sentence, and the direction of an alphabetic character.

[0018] The character recognition dictionary 13 stores character code data, and in the direction judging processing of an alphabetic character performed by the direction judging section 6 of an alphabetic character, in case it computes the recognition precision of an alphabetic character, it is used in the case of character recognition processing of the character recognition processing section 10. The card file 9 forms the memory area for storing a character code, coordinate positional information, etc. which were stored in data memory 11 per card (each data of alphabetic character point size, a row pitch, the average digit pitch between alphabetic characters, an upper margin, and a left margin) as a result of character recognition processing of the character recognition processing section 10.

[0019] Next, actuation is explained. First, the document reading processing performed by CPU2 is explained with reference to drawing 4 and drawing 5 based on the flow chart shown in drawing 2. Drawing 2 is a flow chart for explaining the document reading processing performed by CPU2. Reading processing of the image data of a card is explained especially in this example. CPU2 makes the image data of a card read, stores the read image data in image memory 5 (step S1), subsequently to the direction judging section 6 of an alphabetic character, makes an image reader 4 perform the direction judging processing of an alphabetic character, and makes it first judge the direction of a character string, the direction of the head of the sentence, and the direction of an alphabetic character of this read image data in drawing 2 (step S2).

[0020] This direction judging processing of an alphabetic character is explained to a detail with reference to drawing 5 and drawing 6 based on the flow chart shown in drawing 3 and drawing 4. Drawing 3 and drawing 4 are flow charts for control of CPU2 to explain the direction judging processing of an alphabetic character performed by the direction judging section 6 of an alphabetic character.

[0021] Drawing 5 is drawing for explaining the stroke which judges the direction of a character string and the direction of the head of the sentence of the direction judging processing of an alphabetic character. Drawing 6 is drawing for explaining the stroke which judges the direction of an alphabetic character of the direction judging processing of an alphabetic character. By the way, it is necessary to recognize the distinction with these columnar writing and lateral writing of a character string, i.e., the direction, and in Japanese, since there are columnar writing and lateral writing, as shown for example, in drawing 6 (A) - (H), eight kinds of directions of an alphabetic character (the alphabetic character sense direction) can be further, considered according to the direction of a manuscript.

[0022] In drawing 3, first, it is read by the image reader 4, and the image data of a card as shown in drawing 5 (A) divides into a line block the image data stored in image memory 5 like drawing 5 (B), and judges from the text layout of the image data in which it was stored by image memory 5, the direction of a character string, i.e., direction, of this line block, (step S11). As shown in drawing 5 (B), when the direction of a character string (the line block direction) is a longitudinal direction, while judging the direction of a character string to be a longitudinal

direction and shifting to step S12, when it judges with the direction of a character string being a lengthwise direction, it shifts to step S31 of drawing 14.

[0023] Subsequently, in step S12, the left or the right is analyzed from the text layout of an image data, the direction of a line set of the head of the sentence, i.e., direction, of a line block in the judged direction of a character string (longitudinal direction), and the direction which intersects perpendicularly, and it judges the direction which has complete set of line to be the direction of the head of the sentence (step S12). In this case, as shown in drawing 5 (B), when the direction of the head of the sentence is the left, while the direction of the head of the sentence judges that it is the left and shifts to step S13, when it is judged that the direction of the head of the sentence is the right, it shifts to step S14.

[0024] In addition, when the direction of the head of the sentence is intermingled the right and leftward, the direction of a side with much grand total of the direction of the head of the sentence is decided with the direction of the head of the sentence. The case where they are the case where the direction of an alphabetic character is the "left", and the "right" as shown in drawing 6 (A) and (B) when it is judged in step S12 that the direction of the head of the sentence is the left thinks, and it is \*\*\*\*.

[0025] In step 13, character recognition is first performed by making the direction of an alphabetic character into a "top" (step S13). Then, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X1 (step S14).

[0026] Character recognition is performed by making the direction of an alphabetic character into the "left" (step S15). Subsequently, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X2 (step S14).

[0027] And at step S17, the recognition precision X1 and X2 stored in the recognition precision memory 7 is measured, the direction where recognition precision is high is decided as a direction of an alphabetic character (step S17), the direction judging processing of an alphabetic character concerned is ended, and it shifts to character recognition processing of step S3 of drawing 2. The case where they are the case where the direction of an alphabetic character is the "right", and the "bottom", on the other hand as shown in drawing 6 (C) and (D) when it is judged in step S12 that the direction of the head of the sentence is the right thinks, and it is \*\*\*\*.

[0028] In step 18, character recognition is first performed by making the direction of an alphabetic character into the "bottom" (step S18). Then, the recognized

alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X1 (step S19).

[0029] Character recognition is performed by making the direction of an alphabetic character into the "right" (step S20). Subsequently, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X2 (step S21), and shifts to step S17.

[0030] moreover, when it is judged in step S11 that the direction of a character string (line block) is a lengthwise direction Shift to step S31 shown in drawing 4 , and the judged direction of a character string (lengthwise direction) and the direction of the head of the sentence in the direction which intersects perpendicularly analyze "above" and down [ "down" ] from the text layout of an image data. When the direction which has complete set of line is judged to be the direction of the head of the sentence (step S31) and it judges with the direction of the head of the sentence being above, while shifting to step S32, when it is judged that the direction of the head of the sentence is down, it shifts to step S36.

[0031] The case where they are the case where the direction of an alphabetic character is a "top", and the "right" as shown in drawing 6 (E) and (F) when it is judged in step S31 that the direction of the head of the sentence is above thinks, and it is \*\*\*\*.

[0032] In step 32, character recognition is first performed by making the direction of an alphabetic character into a "top" (step S32). Then, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X1 (step S33).

[0033] Character recognition is performed by making the direction of an alphabetic character into the "right" (step S34). Subsequently, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X2 (step S34), and shifts to step S17 of drawing 3 .

[0034] The case where they are the case where the direction of an alphabetic

character is the "bottom", and the "left" as shown in drawing 6 (G) and (H) when it is judged in step S31 that the direction of the head of the sentence is down thinks, and it is \*\*\*\*.

[0035] In step 36, character recognition is first performed by making the direction of an alphabetic character into the "bottom" (step S36). Then, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X1 (step S37).

[0036] Character recognition is performed by making the direction of an alphabetic character into the "left" (step S38). Subsequently, the recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, It stores in the recognition precision memory 7, computing, similarity, i.e., recognition precision, with the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, and using acquired recognition precision as X2 (step S39), and shifts to step S17 of drawing 3 .

[0037] And in step 3 of drawing 2 , CPU2 makes the character recognition processing section 10 perform character recognition processing, and the character recognition processing section 10 is the direction of an alphabetic character decided at step S17 of drawing 3 by the direction judging section 6 of an alphabetic character, and performs character recognition to the whole manuscript image read in the manuscript. The alphabetic character extracted from the manuscript image data specifically stored in image memory 5 based on the direction of an alphabetic character decided at step S17 of drawing 3 is recognized. The recognized alphabetic character, The alphabetic character which performed the comparison (pattern matching) with the criteria alphabetic character beforehand stored in the character recognition dictionary 13, and has been recognized, The character code of the alphabetic character most approximated to the alphabetic character recognized in this criteria alphabetic character, the coordinate positional information of the alphabetic character on an image, etc. are stored in data memory 11 (step S3). In step S4, CPU2 stores in a card file the character code stored in data memory 11, the coordinate positional information of the alphabetic character on an image, etc. per card (step S4), and ends the document reading processing concerned.

[0038] In the above-mentioned example, it is the limited direction of an alphabetic character, and it is the alphabetic character unit like a reason and the conventional character recognition control unit which is the configuration of performing character recognition of the whole manuscript image, and from the four directions of vertical and horizontal, as compared with the approach of performing character recognition, respectively, the count of recognition decreases, the process speed of character recognition is gone up, and an operator's working efficiency improves. Moreover, in the above-mentioned example, since this direction of an alphabetic character is judged based on the direction of a character string, the direction of an alphabetic character, and character recognition precision, it is a simple approach, and is accurate, and the direction of an alphabetic character

can be judged.

[0039] In addition, in the above-mentioned example, although the case where a card was read was explained, you may decide not to limit this invention to this and to read a postcard, the usual document data, etc. Moreover, in the above-mentioned example, although the case where Japanese was read was explained, you may decide not to limit this invention to this and to read English etc.

[0040] Moreover, in the above-mentioned example, although it is the limited direction of an alphabetic character and being carried out for performing character recognition of the whole manuscript image, you may decide to carry out character recognition in the direction of an alphabetic character which limited a part of manuscript image. Moreover, in the above-mentioned example, although pattern matching is performing character recognition processing, character recognition processing may be performed by the structural-analysis method.

[0041]

[Effect of the Invention] As explained above, according to the character recognition control device according to claim 1, the reason and the count of recognition which are the configuration of performing the whole manuscript image or a part of character recognition decrease in the limited direction of an alphabetic character, the process speed of character recognition is gone up, and it becomes possible to raise an operator's working efficiency.

[0042] Moreover, according to the character recognition control unit according to claim 2, since the direction of an alphabetic character is judged based on the direction of a character string, the direction of an alphabetic character, and character recognition precision, it is a simple approach, and is accurate, and the direction of an alphabetic character can be judged.

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[Translation done.]